

CBS

CBS Inc., 1800 M Street, N.W.
Washington, D.C. 20036
(202) 457-4321

ORIGINAL
FILE

RECEIVED

NOV 18 1987

Federal Communications Commission
Office of the Secretary

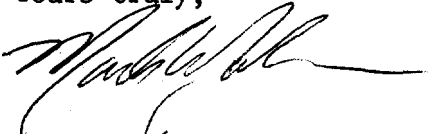
Re: MM Docket No. 87-268

Dear Mr. Tricarico:

November 18, 1987

Enclosed are an original and 11 copies of the Comments of CBS Inc. in the above proceeding, relating to the Commission's August 20, 1987 Notice of Inquiry on advanced television systems and their impact on the existing television service. Please direct any questions to the undersigned.

Yours truly,



Mark W. Johnson
Associate Washington Counsel

Honorable William J. Tricarico
Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

0711

ORIGINAL
FILE *u*

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

RECEIVED

NOV 18 1987

Federal Communications Commission
Office of the Secretary

In the Matter of

Advanced Television Systems
and Their Impact on the Existing
Broadcast Service

)
)
)
)
)

MM Docket No. 87-268

COMMENTS OF CBS INC.

November 18, 1987

TABLE OF CONTENTS

Summary.....	iii
Introduction.....	1
I. The State Of Development Of HDTV In The Nonbroadcast Marketplace.....	7
A. HDTV Developments Are Nurturing The Growth Of Nonbroadcast HDTV.....	8
B. A Vast Archive Of HDTV Programming Already Exists.....	10
II. Evaluation Of Advanced Television Systems.....	12
A. Criteria For An Advanced Television System.....	12
B. The Status Of Advanced Television Development.....	19
C. Quality-For-Bandwidth Trade-Offs.....	21
III. Spectrum Allocation Issues.....	24
A. The Commission Cannot Make Appropriate Spectrum Allocations To Accommodate Terrestrial HDTV Broadcasting Until An Expedited Propagation And Systems Testing Program Is Pursued And Necessary Information Is Obtained.....	24
B. The Commission Should Acknowledge Some Guiding Principles For Future Allocations Decisions.....	27
1. Any Terrestrial HDTV Broadcast System Ultimately Implemented In The United States Should Allow All Existing VHF And UHF Licensees To Cover Their Present Service Areas With An HDTV Signal, And The Present Allocations Scheme Should Not Be Disrupted In The Interim.....	28
2. The Ultimate Nature Of The Terrestrial HDTV Broadcasting Service Depends On The Characteristics Of The Transmission System Selected.....	29

3.	The Planning Factors For Terrestrial HDTV Broadcasting Implementation Will Depend Upon The Method Used For Transmission.....	31
C.	While Propagation And System Testing Proceeds, The Commission Should Develop Information On The Continuing Need For UHF Taboos In The HDTV Environment.....	34
D.	Until The Necessary Questions Have Been Answered, The Commission Must Preserve All Of Its Options For Allocating The Necessary Spectrum To Implement Terrestrial HDTV Broadcasting.....	36
IV.	Advanced Television Compatibility Issues.....	41
A.	The Commission Should Take A Flexible And Comprehensive Approach To The Issue Of Compatibility...	41
B.	The Commission Should, If Necessary, Consider HDTV/NTSC Simulcasting As An Alternative Way To Achieve The Underlying Purpose Of Compatibility.....	45
V.	Policy Issues.....	48
A.	It Is Strongly In The Public Interest That Existing Broadcasters Be Allowed An Opportunity To Broadcast Terrestrially In HDTV.....	48
B.	No Potential Competing Use Of The Available Spectrum Space Presents Such Compelling Public Interest Considerations.....	52
1.	Land Mobile Radio.....	53
2.	DBS.....	53
3.	Additional UHF Stations.....	54
C.	Sufficient Spectrum To Enable Terrestrial HDTV Broadcasts Should Be Allocated To Each Existing Broadcaster.....	55
D.	It Is Premature At This Point To Consider Permitting Private Arrangements Between Broadcasters Regarding Interference Levels.....	56
	Conclusion.....	57
	Appendix A	
	Appendix B	

SUMMARY

This Inquiry represents an important first step in the process of enabling local television stations to provide a high-definition television service to the audiences of their free over-the-air programming. This process needs to be completed expeditiously since nonbroadcast video programming of a technical quality far surpassing that of current broadcast transmissions is soon to be available in this country, and a standard for high-definition program production is rapidly proceeding toward adoption and implementation. CBS intends to be actively involved with the Commission's Advisory Committee on Advanced Television Services and the Advanced Television Systems Committee as those organizations proceed in their work related to this Inquiry.

Because terrestrial broadcasters should not be relegated to second-class status in the video marketplace, any broadcast transmission standard ultimately adopted should approximate the technical quality of systems anticipated for nonbroadcast use and maintain some flexibility in the relevant technical parameters in order to accommodate future technological developments. It also should:

- be technically suitable for terrestrial broadcasting;
- utilize demonstrated and field-proven technology;
- be designed and implemented to preserve the public investment in existing television receivers;
- make efficient use of the spectrum;
- be capable of utilizing the 1125/60 high definition production standard.

It is too soon to evaluate the various advanced television system proposals mentioned in the Notice, and rigorous objective and subjective testing in realistic operational environments must be undertaken of all systems far enough along in development to be demonstrated and evaluated.

This testing should be carried out expeditiously and should result in information about the VHF/UHF or microwave spectrum requirements of proposed systems that will guide the Commission in making ultimate spectrum allocations decisions. When making those allocations decisions the Commission should allow sufficient appropriate spectrum for each present VHF and UHF licensee to provide a high-definition signal throughout its present service area, and the present allocations scheme should not be disrupted in the interim.

The spectrum allocations issues raised in the Notice should not be attempted to be resolved in isolation from the ongoing process of testing and evaluating proposed transmission systems. Decisions on the amount of new spectrum needed, and whether that spectrum is to come from VHF/UHF or microwave bands, depends largely on the characteristics of each such proposed system. Similarly, the planning factors that will be applied to a terrestrial high-definition television broadcast system and the continuing need

for UHF taboos in the HDTV environment cannot be determined except by reference to the results of system testing.

In the meantime, the Commission should maintain all of its ultimate allocations options. The Commission has already appropriately acted to defer further land mobile sharing of UHF frequencies. Similarly, it should ensure the continued availability of microwave spectrum in the event that terrestrial microwave delivery of high-definition television proves to be practical and desirable.

With respect to the Commission's concern that a high-definition terrestrial broadcast transmission system be "compatible" with current NTSC receivers, CBS agrees that the Commission should protect the public's investment in those sets. However, this can be achieved in either of two ways. One way -- consistent with the usual definition of "compatibility" -- would be to adopt a high-definition transmission standard that allows the display of a portion of that high-definition transmission as an acceptable NTSC picture on those receivers. If this is not practical, another way to achieve the same result is to allot sufficient appropriate spectrum to present licensees to accommodate the simulcasting of NTSC and high-definition programming, at least during a transition period. The Commission should not foreclose the second functionally similar option by taking a narrow view of "compatibility."

As a matter of policy, it is strongly in the public interest that today's terrestrial broadcasters be able to participate fully in the high-definition marketplace because of the unique public benefits they are providing through our system of free, universally available, locally licensed over-the-air television. No other competing spectrum use can match these public interest considerations.

ORIGINAL
FILE

RECEIVED

NOV 18 1987

Federal Communications Commission
Office of the Secretary

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
Advanced Television Systems)
and Their Impact on the Existing)
Broadcast Service)

MM Docket No. 87-268

COMMENTS OF CBS INC.

CBS Inc. ("CBS") submits these Comments in the above proceeding, in which the Commission has initiated a "wide-ranging inquiry to consider the technical and public policy issues surrounding the use of advanced television technologies by television broadcast licensees." The Commission has expressed the hope that the inquiry will elicit "information that will help [it] better understand the advantages and disadvantages of the various terrestrial broadcast [advanced television] implementation options." (Notice of Inquiry ("Notice") at ¶3.) To this end, the Notice poses an extensive list of questions on alternative advanced television systems, spectrum allocation, advanced television compatibility, and related policy matters. CBS is pleased to offer its views on these issues.

INTRODUCTION

CBS believes that the technical and public policy issues facing the Commission in establishing the regulatory foundations for the introduction of advanced television ("ATV") systems in terrestrial

broadcasting are among the most important and difficult in recent history. CBS thinks it vital that these issues be resolved before nonbroadcast video programming of a technical quality far surpassing that possible using the present broadcast transmission standard, and distributed without the constraints imposed by current broadcast channel allocations, is widely available to the public. Inaction or excessive regulatory delay in this area will necessarily relegate local broadcast stations to second-class technical status, since nonbroadcast video distribution will quickly gain a technological advantage that will be difficult, and perhaps impossible, for terrestrial broadcasters to overcome. Appropriate action by the Commission is thus essential to the public interest in preserving free over-the-air local broadcasting as a meaningful competitor in the video marketplace.

CBS has long played a leading role in the development of broadcast-related technology, and is committed to continue its efforts to contribute to innovation in this field. Accordingly, CBS looks forward to active participation in the work of the Advisory Committee on Advanced Television Services recently appointed by the Commission to assist in the study of issues related to this Inquiry.* CBS also intends to continue as an active member of the Advanced Television Systems Committee ("ATSC"), a private association of American companies now engaged in valuable work

* CBS's Chief Executive Officer, Laurence A. Tisch, is a member of the Advisory Committee, and Joseph Flaherty, Vice President and General Manager, Engineering and Development, CBS Broadcast Group, is Chairman of the Subcommittee on Planning. FCC News, Ref. No. 142, October 9, 1987.

relating to the development of HDTV standards for both television production and transmission. ATSC has been, and, CBS believes, should continue to be, the primary body concerned with the development of advanced television system standards.

In these Comments, CBS will respond in as much detail as is presently possible to the technical and policy questions posed in the Notice. However, CBS wishes to emphasize at the outset certain basic propositions that it believes should guide the Commission's deliberations in this complex field.

First, CBS strongly believes that nothing less than a true HDTV transmission standard should ultimately be adopted. Accordingly, candidate transmission systems should at least approximate the technical quality of HDTV systems that are under consideration by nonbroadcast video distribution media for implementation in this country.* CBS believes that aiming for such a standard will focus

* See, generally, High-Definition Television: An Opportunity For Cable, Home Box Office, Inc., June 15, 1987. The Notice uses the term "ATV" to refer to "any system that improves television audio and video quality or enhances in any way the current NTSC system... ." (Notice at ¶19.) CBS uses the term "ATV" herein in that same sense. By "HDTV," as used in these Comments, we mean a television transmission system that approaches the quality attainable with 1125 scanning lines and 60 fields per second; has approximately a 16:9 aspect ratio; offers greatly improved color rendition through the use of wider bandwidth color channels; and includes multi-channel digital sound.

the energies of interested parties on the same goal and will thus maximize the likelihood of success.

Second, inasmuch as nonbroadcast HDTV distribution to home television viewers appears to be imminent, expeditious action by the Commission is necessary to ensure that American broadcasters can offer HDTV service to the public on a level of competitive parity. The certainty that cable, VCRs and video disks will introduce HDTV into the American consumer marketplace within a very few years is a central truth that should animate the Commission, the Advisory Committee, the ATSC, and individual American broadcast organizations. While the complexity of the issues requires that the Commission and the affected industries pursue solutions in an orderly and careful manner, the Commission must be mindful of the time pressures that are being imposed by the world marketplace.

Thus, CBS believes that the highest priority for the Commission should be to develop a plan that will facilitate the introduction of a domestic terrestrial HDTV broadcast system within four or five years. The broad scope of the present Inquiry will undoubtedly elicit a bewildering assortment of views on the range of questions posed. While hard information on many of the technical questions asked is not now available, CBS believes that it can be generated in a timely fashion if an intensive program of propagation, laboratory and field testing of candidate systems, along with a program of

subjective tests of picture and sound quality, is diligently and quickly pursued.

During the pendency of this expedited testing program, the Commission should take no action that would prematurely constrain the availability of UHF or microwave spectrum for HDTV broadcast use. This forbearance is critical, since the technical questions that bear on the amount of new spectrum required for competitive HDTV broadcasting, and the question of whether that spectrum should properly come from present UHF or microwave allocations, or both, cannot even be tentatively answered at this time. Under these circumstances, CBS applauds the Commission's recent decision to postpone further sharing of the UHF band with land mobile radio.* Although the Commission has decided not to reserve a portion of the 12 GHz spectrum for terrestrial broadcasting at this time, CBS continues to urge the Commission to take no action that would foreclose the possibility of sharing or reallocating this or other microwave spectrum that might prove to be promising for terrestrial HDTV transmission.

Against the backdrop of the general propositions noted above, CBS responds in these Comments to specific questions raised in the Notice regarding advanced television technologies, spectrum

* Order, GEN. Docket No. 85-172, released October 21, 1987.

allocation, advanced television compatibility, and related policy matters. With regard to advanced television technologies, CBS sets forth its understanding of the state of development of HDTV in general and offers preliminary comments on ATV systems that have thus far been proposed. The discussion of spectrum allocation issues focuses on the need for the Commission to preserve all options until intensive testing over the next 24 months permits informed judgments on the relative performance of proposed transmission systems in various spectrum bands.

In commenting on the notion of "compatibility," CBS suggests that the Commission take a flexible approach which recognizes differing levels of compatibility and the trade-offs in system quality that will predictably accompany higher degrees of compatibility of an HDTV transmission with existing receivers. CBS further suggests that the purpose of compatibility -- i.e., to ensure that the viewer has uninterrupted access to the programming of a broadcast television licensee during the transition period to a universal HDTV system -- can be accomplished in different ways, including simultaneous NTSC and HDTV transmissions.

Finally, CBS addresses, at least preliminarily, the policy issues that the Commission will necessarily consider during the course of this Inquiry and subsequent rulemaking proceedings.

The worldwide television systems of today evolved from a laboratory demonstration of crude but recognizable images just 62 years ago. Over those years, there have been many difficult and significant governmental decisions, primarily by the Commission, that have cleared the way for implementation of many major advances in broadcast technology.* The pace of technological change has quickened in recent years, and the Commission is now faced with a new set of difficult, far-reaching decisions before terrestrial broadcasters are able to transmit over-the-air television signals to home viewers in high definition.

I. THE STATE OF DEVELOPMENT OF HDTV IN THE NONBROADCAST MARKETPLACE

In recent years, the accelerating pace of development of video distribution technology** has spawned a host of competitive delivery systems -- most without the spectrum constraints of broadcasting, and all without the common tradition of over-the-air broadcasters of free local service to their communities. It would be ironic indeed

* Some of those significant decisions are discussed in 101 Years of Television Technology, O'Brien and Monroe, 85 SMPTE Journal 457 (1976).

** For a more detailed review of the recent rapid pace of technological developments, see Remarks of Joseph A. Flaherty, Vice President and General Manager, Engineering and Development, CBS Broadcast Group, before the International Broadcasting Symposium, Tokyo, Japan, November 21, 1985.

if the one service historically and currently relied upon by its audiences for the local news, information and other programming directly responsive to their particular interests is disabled from competing effectively with other distribution media that have neither the inclination nor the obligation to provide such programming.

In the past five years, high definition technology has made enormous advances, developing faster than most expected*, and the consumer applications of this technology are developing rapidly in nonbroadcast video. In a very few years, American viewers' expectations regarding the technical quality of television will increase dramatically, as many of these nonbroadcast video distribution media actively compete for home television viewers in the new wide-screen high definition arena.

A. HDTV Developments Are Nurturing The Growth Of Nonbroadcast HDTV.

An HDTV program production standard is quickly emerging that will fuel the introduction of HDTV distribution in this country and throughout the world. This proposed single standard for high

* CBS was among the few who predicted that HDTV technology would evolve much faster than generally believed. See, Testimony of Joseph A. Flaherty before the House Subcommittee on Telecommunications and Finance, Serial No. 97-81, 97th Cong., 2d Sess. (December 15, 1981).

definition television studio production and program exchange, has been further developed and tested over a five-year period by many broadcast and standards organizations throughout the world.* It was considered by the Consultative Committee on International Radio (CCIR) at its Plenary Assembly in 1986, and incorporated in the annex of the CCIR's report on HDTV as the only recommended standard.** It is hoped that a further period of study will resolve reservations expressed by several national administrations in Europe. In the United States, this production standard (1125 lines/60 fields per second with a 16:9 aspect ratio) is in the process of final approval by the SMPTE and the ATSC.***

At the same time, implementation of that production standard has continued apace. By one recent count, 25 manufacturers are engaged in the manufacture of equipment utilizing the 1125/60 standard,

* Organizations involved in this activity include the Society of Motion Picture and Television Engineers (SMPTE), ATSC, the North American National Broadcasters' Association (NANBA), the European Broadcasting Union (EBU), the Inter-Union Meeting of the World Broadcasting Unions and others.

** Report 801-2, CCIR Study Group 11, Dubrovnik, 1986.

*** Signal Parameters of the 1125/60 High Definition Television Production System, Society of Motion Picture and Television Engineers, SMPTE Document N15.040, August 11, 1987; Signal Parameters of the 1125/60 High Definition Television Production System, Document T3/142, Advanced Television Systems Committee, September 4, 1987. This HDTV production standard is hereinafter referred to as "the 1125/60 standard."

and new equipment is regularly being introduced. Of these, eight are United States companies, six are European, and eleven are Japanese. The HDTV production equipment now available includes entire systems, including cameras, lenses, videotape recorders, editors, switchers, special effects systems, graphics and matting systems, tape-to-film transfer systems and telecine equipment.* In sum, virtually every piece of equipment needed for the production of television programming in the 1125/60 HDTV standard is now available in the marketplace.

B. A Vast Archive of HDTV Programming Already Exists.

With the widespread availability of HDTV production equipment, many studios worldwide have begun to produce programming using the 1125/60 standard. Production companies in Canada, France, Germany, Italy, Japan and the United States have already produced full-length television features, mini-series, musicals, music videos, rock concerts, television commercials, and other forms. CBS itself plans to produce this season a made-for-television movie using the 1125/60 production standard.**

* Appendix A hereto is CCIR Document 11/105, a July 1987 submission to the CCIR Study Group which discusses the status of HDTV production systems and includes a list of manufacturers and the equipment they have exhibited or produced.

** Appendix A also identifies broadcasting companies throughout the world and the productions for which they are utilizing the 1125/60 standard.

Important as the 1125/60 production standard is for the economics and efficiency of television program production and for international program exchange, nonbroadcast HDTV is not limited to programs produced electronically to that standard. The vast archives of feature films, together with all current feature film productions, are themselves high definition. Such programming is immediately available and readily convertible to HDTV formats for use by nonbroadcast HDTV distribution media (e.g., VCRs, video disks and cable.)

The fact of the immediate availability of HDTV programming has not escaped the notice of American program distributors that are not constrained by regulatory processes. For example, Home Box Office has concluded in its own study of high definition television, referring particularly to the 1125/60 production system, that:

"...[I]t appears likely that an HDTV system, composed of an HDTV television and VCR/optical disk player, will be introduced into the consumer marketplace within three years. Similarly, some form of HDTV programming will be in consumer homes within four to five years, with software delivered via a VCR/disk built into the television set. ... It is in [the cable industry's] mutual interest to take a proactive role in ensuring HDTV's compatibility [with packaged video] so that the cable industry becomes a major source of HDTV programming for consumers."*

* High-Definition Television: An Opportunity for Cable, supra, at 1,3.

The inexorable march of HDTV implementation in nonbroadcast applications underscores the urgency of expeditious action by the Commission to allow terrestrial broadcasters and the audiences for their programming fully to participate in this technological and market environment, and CBS is pleased that the Notice acknowledges the important role the Commission can and should play.

II. EVALUATION OF ADVANCED TELEVISION SYSTEMS

Technical evaluation of proposed ATV systems will be a critical concern of the ATSC and the Commission's Advisory Committee over the next two years. While it is certainly premature to offer any conclusions at this time about the relative merits of various systems for use in the terrestrial broadcasting environment, it is important as a threshold matter to consider the criteria by which those systems should be evaluated. CBS here proposes such criteria and attempts to categorize in a useful way the various types of ATV systems. Appendix B sets forth what is known about those systems in light of the criteria that CBS believes should be applied.

A. Criteria For An Advanced Television System

In the Notice the Commission recalls the evolution of the NTSC standard and recognizes its limitations, particularly when compared to the potential of advanced television technologies. (Notice at ¶¶5-17.) As the United States enters a transitional period in the

development and implementation of a significant new phase in broadcast technology, CBS proposes that six general objectives be kept in mind. Specifically, CBS believes that in order to be acceptable for adoption as an HDTV transmission standard, a proposed system should: (1) be technically suitable for terrestrial broadcasting; (2) achieve a competitive degree of high technical performance; (3) utilize demonstrated and field-proven technology; (4) be designed and implemented in a way that preserves the value of public investment in existing television receivers; (5) make efficient use of radio frequency spectrum; and (6) be capable of utilizing the accepted HDTV production standard.

First, any new advanced television system should be technically suitable for terrestrial broadcasting. This nation enjoys an over-the-air, advertiser-supported broadcast system that has served the public well, and now reaches nearly all American homes with the free broadcast signals of local television stations providing local, regional and national programming to the viewers in their service areas. Cable is a pay service that now passes nearly 80% of the nation's households, and approximately 50% of the homes in the United States have been wired.* To continue to provide a local service to the vast audience still unserved, and likely

* Cablevision, September 28, 1987, at 64.

to remain unserved, by cable, any new advanced television system should be capable of being delivered by means of an over-the-air terrestrial broadcasting signal to the home.

Terrestrial broadcasting can be preserved if the selected ATV system can operate within the current TV channel allocations in the VHF or UHF bands; or if the selected ATV system can be accommodated in a combination of more than one channel in the VHF/UHF bands and enough spectrum is available to allow each current licensee parity access to the new channel allocation; or if adequate additional spectrum can be allocated that is practical for terrestrial broadcasting. The ATSC has begun a program to study and measure the propagation characteristics of broadcast and microwave frequency bands that may be suitable for ATV use.* Until these tests are completed, the feasibility of any of the approaches cannot be established.

Some of the proposed systems would use spectrum more efficiently than others. Proposals that are based on the new ATV service being carried in the current UHF and VHF allocations may be the

* Presentation by Robert Hopkins, Executive Director, ATSC, to the MST HDTV Conference, Washington, D. C., September 23, 1987.

most efficient from the viewpoint of new spectrum allocation, but their ability to meet the performance goals has yet to be proven.*

Second, any new advanced television system should provide a competitive level of high definition television.** Competition in the video marketplace, already keen, will be intensified by the introduction of HDTV. The addition of HDTV services by cable, prepackaged programming on HDTV video cassettes or discs, or satellite-to-home transmission will not only add new programming and

* Such systems will also have to be evaluated for their interference characteristics and to determine whether they result in new and unacceptable artifacts when viewed on NTSC receivers.

** Over the past several years, much discussion has occurred in international and national organizations, as well as within the affected industries, about the technical quality objectives of HDTV. The agency responsible for telecommunications matters under the aegis of the United Nations is the International Telecommunications Union (ITU). One of the ITU's permanent organs is the Consultative Committee on International Radio (CCIR), which, inter alia, studies and issues recommendations on technical and operating questions, including standards, relating specifically to radiocommunications. The United States participates in the CCIR through the Department of State, with the assistance of the FCC and other interested Federal agencies. See Statement of Ambassador Diana Lady Dougan, U.S. Coordinator and Director, Bureau of International Communications and Information Policy, Department of State, before the Subcommittee on Communications, Committee on Commerce, Science and Transportation, United States Senate, February 26, 1987. Therein, Ambassador Dougan says: "An important initiative of our Bureau this past year has been the shepherding of an international standard for high definition television (HDTV)." Dougan Statement, at 20.

scheduling options but will also provide picture and sound quality that will create an entirely new dimension to television competition. Unless terrestrial broadcasters can compete on the same quality level, they will be severely handicapped in competition with cable and other programming services not restricted by similar frequency constraints.

A transmission standard for terrestrial HDTV broadcasting in the United States should at least approximate the best quality levels expected to be achieved by the competitive cable, packaged video and direct broadcast satellite systems. It can be expected that nonbroadcast media may adopt a system at least comparable in performance to the MUSE system.* Under these circumstances, the standard adopted for broadcast transmission should seek to achieve a similar level of quality. Further, the transmission standard adopted and its underlying technology should provide technical quality headroom, so that further improvements in quality can be accommodated.

Third, any advanced television transmission system should utilize currently demonstrable technology. In order to be competitive to cable, packaged video, and direct broadcast satellite systems, high definition television by terrestrial broadcasting should be

* Cablevision, October 26, 1987, at 29. For a description of the MUSE system, see "HDTV Broadcasting And Transmission System-MUSE," Ninomiya, Ohtsuka, Izumi, Gohshi, Iwadate, HDTV Colloquium '87, Vol 1, pp. 4.1.1-4.1.31 (October 1987).

introduced at approximately the same time as the introduction of advanced services within the United States by other distribution media. Cable can be expected to begin high definition transmissions as soon as HDTV sets are in the homes, perhaps by 1991.* To be competitive, therefore, the advanced television system selected for broadcast transmission should utilize currently known technology, capable of being demonstrated and implemented expeditiously, so that such a broadcast service can be introduced commercially in four to five years.

Fourth, the public investment in existing television sets should be protected during the transition to high definition television.** The Commission should do its utmost to achieve this objective in combination with the other five objectives, either by adopting standards that would allow reception of a portion of the HDTV signal by current NTSC receiving sets, which is analogous to what the Commission did when it adopted the color television

* An HBO official recently said that HDTV is an urgent priority, and that the competition cable must initially meet is "not the quality the broadcaster produces but the quality of the picture the consumer can produce in his own home." That official went on to say that he expects VCRs to be the first medium (in 1990) to supply HDTV pictures to homes. Communications Daily, October 22, 1987, at 9.

** Approximately 100 million television sets were sold to retailers during the 1982-86 period alone. 1987 Edition: Electronic Market Data Book, Electronic Industries Association (1987), at 15.